experience an oversupply of these workers while others may have a shortage. Employment and apprenticeship opportunities should be greatest in metropolitan areas, where most glazing contractors and glass shops are located.

Earnings

In 1998, median hourly earnings of glaziers were $12.70. The middle 50 percent earned between $10.26 and $16.45. The lowest 10 percent earned less than $7.91 and the highest 10 percent earned more than $21.91. Median hourly earnings in the industries employing the largest number of glaziers in 1997 are shown below:

Miscellaneous special trade contractors	$12.50
Paint, glass, and wallpaper stores	11.20

Glaziers covered by union contracts generally earn more than their non-union counterparts. According to the limited information available, average hourly earnings—including benefits—for glaziers who belonged to a union and worked full time, ranged between $15.70 and $43.00 in 1998. Glaziers in New York, Boston, San Francisco, Chicago, Los Angeles, Philadelphia, and other large cities received the highest wages. Apprentice wage rates usually start at 50 to 60 percent of the rate paid to experienced glaziers and increase every 6 months. Because glaziers can lose time due to weather conditions and fluctuations in construction activity, their overall earnings may be lower than their hourly wages suggest.

Many glaziers employed in construction are members of the International Brotherhood of Painters and Allied Trades.

Related Occupations

Glaziers use their knowledge of construction materials and techniques to install glass. Other construction workers whose jobs also involve skilled, custom work are bricklayers, carpenters, floor layers, paperhangers, terrazzo workers, and tile setters.

Sources of Additional Information

For more information about glazier apprenticeships or work opportunities, contact local glazing or general contractors; a local of the International Brotherhood of Painters and Allied Trades; a local joint union-management apprenticeship agency; or the nearest office of the State employment service or State apprenticeship agency.

For general information about the work of glaziers, contact:

☛ International Brotherhood of Painters and Allied Trades, 1750 New York Ave. NW., Washington, DC 20006.

For information concerning training for glaziers contact:

☛ National Glass Association, Education and Training Department, 8200 Greensboro Dr., 3rd floor, McLean, VA 22102.

☛ Glass Association of North America, White Lakes Professional Building, 3310 Southwest Harrison St., Topeka, KS 66611-2279.

Hazardous Materials Removal Workers

(O*NET 87999 and 97989B)

Significant Points

- Formal education beyond high school is not required, but good mathematics skills are important to job performance.
- Employment is expected to grow about as fast as average; job openings will be available in all disciplines, especially lead abatement and decontamination jobs.

Nature of the Work

Increased public awareness and Federal and State regulations require the removal of hazardous materials from buildings, facilities and the environment to avoid further contamination of natural resources and to promote public health and safety. Hazardous materials removal workers identify, remove, package, transport and dispose of various hazardous materials, including asbestos, lead, and radioactive and nuclear materials. The removal of hazardous materials, or "hazmats," from public places and the environment is also called abatement, remediation and decontamination.

Hazardous materials removal workers use a variety of tools and equipment, depending on the work at hand. Equipment ranges from brooms to personal protective suits that are totally contained to avoid exposure. Depending on the threat of contamination, equipment required can include disposable or reusable coveralls, gloves, hard hats, shoe covers, safety glasses or goggles, chemical resistant clothing, face shields and hearing protection. Most workers are also required to wear respirators while working to protect them from airborne particles. These respirators range from simple versions that cover only the mouth and nose to self-contained suits with their own oxygen supply.

Asbestos is a material used in the past for fireproofing roofing, flooring and heat insulation and a variety of other uses. While materials containing asbestos are rarely used in buildings anymore, there are still structures containing the material. Fairly harmless when imbedded in materials, asbestos, when airborne, can cause several lung diseases, including lung cancer and asbestiosis.

Lead was a common building component found in paint and plumbing fixtures and pipes until the late 1970's. Because lead is easily absorbed into the bloodstream, it can travel to vital organs and build up there. The health risks associated with lead poisoning include fatigue, loss of appetite, miscarriage, and learning disabilities and decreased IQ in children. Due to these risks, it has become necessary to remove lead-based products and asbestos from buildings and structures.

Asbestos abatement and *lead abatement workers* remove these and other materials from buildings scheduled to be renovated or demolished. They use a variety of hand and power tools, such as vacuums and scrapers, to remove asbestos and lead from surfaces. The vacuums used by asbestos abatement workers have special, highly efficient filters designed to trap the asbestos, which is later disposed of or stored. During the abatement, special monitors for asbestos and lead content sample the air to protect the workers; lead abatement workers also wear a personal air monitor that indicates how much lead the worker has been exposed to. Workers also use monitoring devices to identify the asbestos, lead and other materials that need to be removed from the surfaces of walls and structures.

A typical residential lead abatement project involves using a chemical to strip the lead-based paint from the walls of the home. Lead abatement workers apply the compound with a putty knife and allow it to dry. Then they scrape the hazardous material into an impregnable container for transport and storage. They also use sandblasters and high-pressure water sprayers to remove lead from large structures.

Radioactive materials are classified as either high- or low-level wastes. High-level wastes primarily are nuclear reactor fuels used to produce electricity. Low-level wastes include any radioactively contaminated protective clothing, tools, filters, medical equipment, and other items. *Decontamination technicians* perform duties similar to janitors and cleaners. They use brooms, mops and other tools to clean exposed areas and remove exposed items for decontamination or disposal. With experience these workers can advance to *radiation protection technician* jobs and use radiation survey meters to locate and evaluate materials, operate high pressure cleaning equipment for decontamination, and package radioactive materials for transportation or disposal.

Decommissioning and decontamination (D&D) workers remove and treat radioactive materials generated by nuclear facilities and power plants. They use a variety of hand-tools to break down contaminated items such as "gloveboxes," which are used to process radioactive materials. At decommissioning sites the workers clean

and decontaminate the facility, as well as remove any radioactive or contaminated materials.

Treatment, storage and disposal (TSD) workers transport and prepare materials for treatment or disposal. To insure proper treatment of materials, laws require workers in this field be able to verify shipping manifests. At incinerator facilities, these workers transport materials from the customer or service center to the incinerator. At landfills, they follow a strict procedure for the processing and storage of hazardous materials. They organize and track the location of items in the fill and may help change the state of a material from liquid to solid in preparation for its storage. These workers typically operate heavy machinery such as forklifts, earth moving machinery and large trucks and rigs.

Hazardous materials removal workers, whether working in asbestos and lead abatement or in radioactive decontamination, must stand, stoop and kneel for long periods of time. Workers may also be required to construct scaffolding or erect containment areas prior to the abatement or decontamination. Government regulation, in most cases, dictates that hazardous materials removal workers are closely supervised on the work site. The standard is usually one supervisor to every 10 workers. The work is very structured, planned out sometimes years in advance and team oriented. There is a great deal of cooperation among supervisors and coworkers. Due to the nature of the materials being removed, work areas are restricted to licensed hazardous materials removal workers, minimizing exposure to the public.

Working Conditions

Hazardous materials removal workers face different working conditions depending on their area of expertise. Although many work a standard 40-hour week, overtime and shift work is not uncommon, especially in asbestos and lead abatement. Asbestos and lead abatement workers tend to work primarily in buildings and other structures, such as office buildings and schools. Because they are under pressure to complete their work and must work around the schedules of others, completing projects often requires night and weekend work.

Treatment, storage and disposal workers are employed primarily at facilities such as landfills, incinerators, boilers and industrial furnaces. These facilities are often located in remote areas due to the kinds of work being done. As a result, workers employed by treatment, storage or disposal facilities may commute long distances to work.

Decommissioning and decontamination workers, decontamination technicians and radiation protection technicians work at nuclear facilities and electrical power plants. These sites, like treatment, storage and disposal facilities, also are often far from urban areas. They may need to use sharp tools to dismantle contaminated objects, often in cramped conditions. A hazardous materials removal worker must have great self-control and a level head to cope with the daily stress associated with working with hazardous materials.

A hazardous materials removal worker sprays to minimize dust during an asbestos abatement.

Hazardous materials removal employees work in a highly structured environment to minimize danger. Each phase of an operation is planned out in advance and workers are trained to deal with safety breaches and hazardous situations. Crew and supervisors take every precaution to insure the work site is safe. Some hazardous materials removal workers must wear fully enclosed personal protective suits for several hours at a time, which may be hot and uncomfortable and cause some individuals to experience claustrophobia.

Hazardous materials removal workers may be required to travel outside their normal working area in order to respond to emergency situations. These emergency cleanups sometimes take several days or weeks to complete and workers usually are away from home for the duration of the project.

Employment

Hazardous materials removal workers held about 38,000 jobs in 1998. About two-thirds were employed by special trade contractors, primarily in asbestos and lead abatement. The next largest industry of employment was sanitary services, including treatment, storage and disposal facilities. A small number worked in electric services at nuclear and electric plants as decommissioning and decontamination workers and radiation safety and decontamination technicians.

Training, Other Qualifications, and Advancement

Formal education beyond a high school diploma is not required to become a hazardous materials removal worker. However, workers must be able to perform basic mathematical conversions and calculations, manipulating readings for consideration during the abatement. To perform the job duties, workers should also have good physical strength and manual dexterity.

Federal regulations require a license to work as a hazardous materials removal worker. Most employers provide technical training on the job, but a formal 32- to 40-hour training program must be completed to be licensed to work as an asbestos and lead abatement worker or a treatment, storage, and disposal worker. The program covers health hazards, personal protective equipment and clothing, site safety, hazard recognition and identification, and decontamination. In some cases, workers will discover one hazardous material while abating another. If the workers are not licensed to work with the newly discovered material they cannot continue to work. Many experienced workers opt to take courses in additional disciplines to counteract this problem. Some employers prefer to hire workers licensed in multiple disciplines.

For decommissioning and decontamination workers employed at nuclear facilities, training is more extensive. In addition to the standard 40-hour training course in asbestos, lead, and hazardous waste, workers must take courses on regulations governing nuclear materials and radiation safety. These courses add up to approximately three months of training, though most are not taken consecutively. Many agencies, organizations and companies throughout the country provide training programs that are approved by the Environmental Protection Agency, the Department of Energy, and other regulatory bodies. Workers in all fields are required to take refresher courses every year to maintain their license.

Job Outlook

Overall employment in this occupation is expected to grow about as fast as the average for all occupations through the year 2008. Employment of the largest group of workers, asbestos and lead abatement workers, is expected to grow as fast as other occupations in special trade contractors, but opportunities will be best in lead abatement. Unlike other occupations in construction trades, employment for these workers is little affected by slowdowns in the economy.

Employment of decontamination technicians, radiation safety technicians, and decommissioning and decontamination workers is expected to grow due to increased pressure for safer and cleaner nuclear and

electric generator facilities. In addition, the number of closed facilities that need decommissioning may continue to grow due to federal legislation. These workers are less affected by fluctuations in the economy because the facilities they work in must operate regardless of the state of the economy.

Earnings

Median hourly earnings of hazardous materials removal workers were $13.28 in 1998. The middle 50 percent earned between $10.76 and $17.85 per hour. The lowest 10 percent earned less than $9.26 per hour and the highest 10 percent earned more than $22.14 per hour.

According to the limited data available, treatment, storage and disposal workers usually earn slightly more than asbestos and lead abatement workers or decontamination technicians. Decontamination and decommissioning workers and radiation protection technicians, though comprising the smallest group, tend to earn the highest wages.

Related Occupations

Asbestos and lead abatement workers share similar skills with other construction trades workers, including bricklayers and stonemasons, concrete masons and terrazzo workers, insulation workers, and sheetmetal workers. Treatment, storage and disposal workers, decommissioning and decontamination workers, and decontamination and radiation safety technicians work closely with plant and system operators such as electric power generating plant operators and water and wastewater treatment plant operators.

Sources of Additional Information

For more information on hazardous materials removal workers, including training information, contact:

☛ Laborers-AGC Education and Training Fund, 37 Deerfield Rd., P.O. Box 37, Promfret, CT 06259.

Insulation Workers

(O*NET 87802)

Significant Points

- Opportunities for insulation workers are expected to be favorable because of high turnover.
- Most insulation workers learn informally on the job; others complete formal apprenticeship programs.

Nature of the Work

Properly insulated buildings reduce energy consumption by keeping heat in during the winter and out in the summer. Refrigerated storage rooms, vats, tanks, vessels, boilers, and steam and hot water pipes also are insulated to prevent the wasteful transfer of heat. Insulation workers install the materials used to insulate buildings and equipment.

Insulation workers cement, staple, wire, tape, or spray insulation. When covering a steam pipe, for example, insulation workers measure and cut sections of insulation to the proper length, stretch it open along a cut that runs the length of the material, and slip it over the pipe. They fasten the insulation with adhesive, staples, tape, or wire bands. Sometimes they wrap a cover of aluminum, plastic, or canvas over it and cement or band the cover in place. Insulation workers may screw on sheet metal around insulated pipes to protect the insulation from weather conditions or physical abuse.

When covering a wall or other flat surface, workers may use a hose to spray foam insulation onto a wire mesh. The wire mesh provides a rough surface to which the foam can cling, and adds strength to the finished surface. Workers may then install drywall or apply a final coat of plaster for a finished appearance.

In attics or exterior walls of uninsulated buildings, workers blow in loose-fill insulation. A helper feeds a machine with fiberglass, cellulose, or rock wool insulation while another worker blows the insulation with a compressor hose into the space being filled.

Insulation workers remove asbestos from buildings.

In new construction or major renovations, insulation workers staple fiberglass or rockwool batts to exterior walls and ceilings before drywall, paneling, or plaster walls are put in place. In major renovations of old buildings or when putting new insulation around pipes and industrial machinery, insulation workers often must first remove the old insulation. In the past, asbestos—now known to cause cancer in humans—was used extensively in walls and ceilings and for covering pipes, boilers, and various industrial equipment. Because of this danger, U.S. Environmental Protection Agency regulations require that asbestos be removed before a building undergoes major renovations or is demolished. When asbestos is present, specially trained workers must remove the asbestos before insulation workers can install the new insulating materials. (See the statement on hazardous materials removal workers elsewhere in the *Handbook*.)

Insulation workers use common handtools—trowels, brushes, knives, scissors, saws, pliers, and stapling guns. They use power saws to cut insulating materials, welding machines to join sheet metal or secure clamps, and compressors for blowing or spraying insulation.

Working Conditions

Insulation workers generally work indoors. They spend most of the workday on their feet, either standing, bending, or kneeling. Sometimes, they work from ladders or in tight spaces. The work requires more coordination than strength. Insulation work is often dusty and dirty, and the summer heat can make the insulation worker very uncomfortable. The minute particles from insulation materials, especially